



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/788,861	02/27/2004	Michael A. Graf	02-IMP-015	7203
29393	7590	07/13/2005	EXAMINER	
ESCHWEILER & ASSOCIATES, LLC NATIONAL CITY BANK BUILDING 629 EUCLID AVE., SUITE 1210 CLEVELAND, OH 44114			LEYBOURNE, JAMES J	
			ART UNIT	PAPER NUMBER
			2881	

DATE MAILED: 07/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<p align="center">Office Action Summary</p>	<p>Application No.</p> <p align="center">10/788,861</p>	<p>Applicant(s)</p> <p align="center">GRAF ET AL.</p>	
	<p>Examiner</p> <p align="center">James J. Leybourne</p>	<p>Art Unit</p> <p align="center">2881</p>	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☒ Claim(s) 19 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| <p>1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)</p> <p>2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</p> <p>3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
 Paper No(s)/Mail Date <u>2/27/04</u>.</p> | <p>4) <input type="checkbox"/> Interview Summary (PTO-413)
 Paper No(s)/Mail Date. ____.</p> <p>5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)</p> <p>6) <input type="checkbox"/> Other: ____.</p> |
|---|---|

DETAILED ACTION

Claim Objections

1. Claim 19 is objected to because of the following informalities: The paragraph beginning "wherein the modulating component includes" appears to have multiple references to some components. For example, it is not clear if "a set of electrically conductive plates located between the ion source and the beamline assembly" is a different component from "an extraction suppression electrode located close to the ion source". The claim would be clarified if the components of the modulating component were parsed and indented so that they are separated.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 9 and 19 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 9 cites "the modulating component comprises a set of deflection electrodes" .

Claim 19 cites "wherein the modulating component includes" " (page 23, line 9) and lists "a set of deflection electrodes (page 23, lines 16-17).

The specification does not explain how a set of deflection electrodes modulates the beam current as cited in claim 1 from which claim 9 depends or in claim 19.

3. Claim 24 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 24 recites the limitation "the source magnet" in lines 5 and 6. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 5, 12, 15, and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Aitken (USPN 4847504).

In Fig. 5, Aitken shows a "typical" ion implanting system that includes an ion source arrangement **30**, an analyzing magnet arrangement **40**, a resolving slit arrangement **50**, a post-acceleration system **60** and a wafer processing system **70**. The analyzing magnet arrangement **40** (beamline assembly downstream of the ion source) focuses ions having the selected charge-to-mass ratio to pass through the aperture **51** in the resolving slit arrangement **50** to enter into a post-acceleration arrangement **60** where they are further accelerated to a preselected energy before striking the wafer **71** which is mounted in the wafer handling apparatus **70** (end station), see column 4, lines 31-39.

The "typical" ion implanting system also comprises a vane unit **48** (component for modulating the beam current located downstream of the analyzer magnet), which controls the beam current reaching the wafer processor system **70**. The vane unit is driven by a high-speed stepper motor and can change the current by approximately 0.1% per step, the step time being one millisecond (column 4, lines 10-14). Typically the stepper motor is controlled by a servomechanism arrangement that drives the stepper motor in response to detecting of actual beam current (column 26, lines 25-29).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 4, 6, 16 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aitken (USPN 4847504).

Regarding claims 4 and 6, Aitken does not specifically state that the resolving slit is electrically conducting but it would be obvious to one of ordinary skill in the art to use conductive plates to avoid buildup of charges due to ions intercepted by the plate.

Regarding claim 16, Aitken is silent on the frequency range and percentage of beam modulation of the current. This would depend on the type of source and would be a matter of routine experiment.

6. Claims 13, 14, 18, 20, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aitken as applied to claim 1 above, and further in view of Bisson et al. (US 20020070347). Aitken does not teach using the detector to develop a waveform or using a faraday cup as the detector. Bisson et al. teach use of a Faraday cup **30** and a dose processor **70** to control ion beam generator **10** in an ion implantation device [0030]. The dose processor **70** receives from Faraday system **20** an electrical current that is representative of the ion beam current received through entrance aperture **44**. The dose processor **70** can be used to control ion beam generator **10** by adjusting the scan waveform to achieve a desired dose uniformity.

It would be obvious to one of ordinary skill in the art at the time of the invention to modify the "typical" ion implanting system described by Aitken to include a Faraday cup and a dose processor to generate a waveform to control the ion beam current as taught by Bisson et al. because Bisson et al. teach that semiconductor fabrication processes typically require dose accuracies within 1% [0005].

7. Claims 7, 8, 22 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aitken and Bisson et al. as applied to claims 1 and 13 above, and further in view of England et al. (USPN 5969366).

Aitken and Bisson et al. do not teach using a source of plasma to neutralize positive charge buildup on a workpiece. England et al. teach that the implanter may include neutralization apparatus between the first electrode and the substrate (column 5, lines 13-17).

Regarding claim 22, the neutralization apparatus of England constitutes a second modulating component downstream of the ion source.

It would be obvious to one of ordinary skill in the art at the time of the invention to modify the "typical" ion implanting system described by Aitken to include provisions for neutralizing surface charge build-up because England et al. teach this is required for higher current implantation of semiconducting substrates (column 3, lines 6-9).

Regarding claim 7, England et al. are silent on the details of the source of electrons used to neutralize charge buildup on the wafer. It would be obvious to

Art Unit: 2881

one of ordinary skill in the art at the time of the invention to use an electrode to control the flow of electrons because this is well known in the art.

Claims 2, 3, 17 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aitken and Bisson et al. as applied to claims 1 and 13 above, and further in view of Bright et al. (USPN 5130552 A).

Regarding claims 2 and 3, Aitken and Bisson et al. do not teach the modulating component comprises one or more plates of an ion beam accelerator or comprises a ground electrode. In Fig. 1A, Bright et al. disclose an ion implantation system that utilizes an ion source with an extraction electrode. The extraction electrode comprises a final electrode 13B, biased at terminal ground reference (ground electrode) so that the final ion beam pre-analysis acceleration is determined by the value of the pre-analysis acceleration voltage applied to the arc chamber itself. The bias electrode is a plate of an ion beam accelerator.

It would be obvious to one of ordinary skill in the art at the time of the invention to use an ion extractor as shown in Fig. 1 because this was well established in the prior art.

Aitken and Bisson et al. do not teach using a controller operatively coupled to the measurement component to adjust at least one of the first modulating component and the source magnet.

Bright et al. disclose an ion source assembly 11 that includes a magnet assembly 12 which has separate electromagnets to produce higher efficiency of ion generation (column 2, lines 11-15). The system also included means for accurately measuring the beam current. The current collected on the beam stop

is fed to a current to voltage converter **53**. The output of the current to voltage converter is fed to a computer control system **75** which is used to perform dose calculations. Beam control vanes **55** in the extraction region of the ion source arrangement also function under computer control routines to apply a controlled degree of trim to the ion beam and thus to control the amount of beam current delivered to the wafer **50** (Column3, lines 60-65).

Regarding claim 3, the final electrode **13B** is biased at a terminal ground reference (column 3, lines 30-35).

It would be obvious to one of ordinary skill in the art at the time of the invention to use a controller operatively coupled to the measurement component to adjust the beam current as taught by Bright et al. because Aitken teaches that it has also been found to be of importance to implement an ion source control system (modulating component), which gives good control over the ion current and operating conditions of the ion source (column 11, lines 1-9).

8. Claims 11 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aitken and Bisson et al. as applied to claims 1 and 13 above, and further in view of Tanakav et al. (USPN 5306921). Tanakav et al. disclose using a magnetic field formed by electromagnets in order to bring the plasma in the ion generating chamber into a concentrated state. A control unit controls current applied by the power supply for the electromagnets as to produce optimum magnetic field intensity for the type of ions to be drawn (abstract).

It would be obvious to one of ordinary skill in the art at the time of the invention to use a controller to produce an optimum magnetic field for an ion

source as taught by Tanakav et al. because Aitken teaches that it has been found to be of importance to implement an ion source control system (modulating component), which gives good control over the ion current and operating conditions of the ion source (column 11, lines 1-9).

9. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Aitken and Bisson et al. as applied to claims 1 and 13 above, and further in view of Kimura et al. (US 20020175296).

Kimura et al. disclose an apparatus and method of ion beam processing comprising an ion source that uses an extraction electrode located near the source (Fig. 1). As known in the art, an extraction electrode can be used to control the amount of current from an ion source.

It would be obvious to one of ordinary skill in the art at the time of the invention to use the extractor electrode to control the current from an ion source as taught by Kimura et al. because Aitken teaches that it has also been found to be of importance to implement an ion source control system (modulating component), which gives good control over the ion current and operating conditions of the ion source (column 11, lines 1-9).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James J. Leybourne whose telephone number is (571) 272-2478. The examiner can normally be reached on M-F 9:00-6:30.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on (571) 272-2477. The fax

phone number for the organization where this application or proceeding is assigned is 703-872-9306.

10. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

June 28, 2005

JJL



JOHN R. LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800